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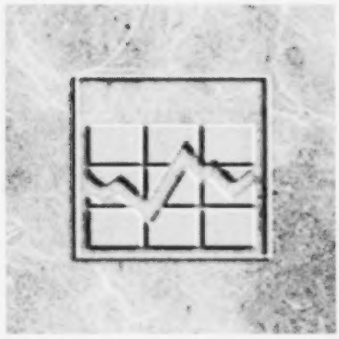
Comparing Low Income of Canada's Regions: A Stochastic Dominance Approach



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Abstract

Comparisons of low income between regions may have impacts on policy choices. However, it is often argued that rankings of distributions are not robust and that they are also quite sensitive to methods of defining low income. This paper avoids these problems by using a stochastic dominance approach to compare regional low income profiles in Canada without arbitrarily specifying a low-income line. This analysis is carried out for the 10 provinces using the Survey of Labour and Income Dynamics for 2000. Robustness of the results is also verified with respect to different choices of spatial price deflators and equivalence scales. The extent to which the findings are sensitive to the choice of an absolute or a relative concept of low income is also examined. We show that, in most cases, dominance relations can be determined and regional low income can be ordered for a wide range of low-income lines. We also show that dominance results are robust to the choice of equivalence scales, while rank reversal occurs when alternative cost-of-living deflators are used. Switching from an absolute to a relative low-income concept only affects low-income rankings for Ontario, Quebec and the Prairie provinces, but not in the case of other provinces. Nevertheless, for all scales, we find that low income is greatest in British Columbia.

Keywords: low-income ordering, low-income measures, stochastic dominance, costs-of-living adjustments

JEL Classification: I32

Executive summary

Regional income disparities have long been a phenomenon in Canada. Examining the extent in magnitude of differences among regional income distributions, particularly low-income outcomes, has had important policy implications. In Canada, a low-income profile across policy regimes is not officially conducted, but it can often be obtained by constructing some cardinal measures—such as the headcount ratio or poverty gap—based on Statistics Canada's low-income cutoffs (LICOs). However, questions have always been raised concerning the robustness of the results, particularly when measurements of the welfare function and low income itself are controversial. The use of such cutoffs entails arbitrary choices, with respect to the proportion of spending on necessities and what constitutes necessities. It can be argued that any revision of these standards would lead to a completely different geographic distribution of low income.

This paper provides a robust way to compare a regional profile of low income in Canada without arbitrarily specifying a low-income line. The empirical analysis is based on the theory of stochastic dominance, which can be used in examining the rankings of income distributions with multiple criteria for a wide range of low-income lines. That is, by comparing the cumulative distribution functions of income between two regions, one may judge whether the choice of a low-income line affects the conclusion about ranking. This avoids using one single line to make a comparison.

Furthermore, this paper also discusses robustness of the results with respect to underlying assumptions made to defining equivalent income: namely, spatial price deflators and equivalence scales. Such scaling factors are required in comparable analysis of income distributions to account for differences in cost-of-living across regions and differences in household composition. That is, in addition to LICO-based price deflators and equivalence scales, we also use an alternative cost-of-living index derived from the market basket measure (MBM) and two other equivalence scales—square root of family size and Organisation for Economic Co-operation and Development (OECD) scales—in the analysis. Finally, since people often compare their relative individual fortune with that of others in similar circumstances, the extent to which the findings are sensitive to the choice of an absolute or a relative concept of low income is also examined.

The main findings are summarized as follows. First, in most cases dominance relations between any two provinces can be determined, and regional low income can be ordered for a wide range of low-income lines. Second, it reveals that rankings of low income based on commonly used LICOs are not robust. An illustration for Newfoundland and Labrador and Ontario shows that the opposite outcomes can be concluded when different lines are chosen. Also, the LICOs only compare the headcount at one low-income line, while ignoring the depth and intensity of low income. The methodology used in this paper offers a more informative and revealing understanding of the distribution of low income. For instance, it is found that Newfoundland and Labrador's low income dominates Alberta at second order, despite the former having a significantly higher LICO-headcount rate than the latter. Third, in 2000, British Columbia ranked the highest in low income, as British Columbia was first-order dominated by all other provinces. Quebec and Manitoba were in the second and third places in the rankings, with Saskatchewan and Alberta fourth, Ontario sixth, and Newfoundland and Labrador and Nova Scotia seventh. New Brunswick and Prince Edward Island were the two provinces with the least low income in Canada.

This paper also demonstrates that dominance results are sensitive to assumptions made to defining equivalent income and the concept of low income. Generally, dominance results are robust to the choice of equivalence scales, while rank reversal occurs when alternative cost-of-living deflators are used. Switching from an absolute to a relative concept of low income has virtually no effect on low-income rankings for British Columbia and the Atlantic provinces, but not in the case for other provinces. The findings urge closer scrutiny on underlying assumptions. Finally, the answer to the question "Where is low income greatest in Canada?" can be confidently referred to British Columbia for the year of 2000. The result is robust for all scales regardless of the choices of low-income lines, cost-of-living factors, equivalence scales and an absolute or a relative concept of low income.

1 Introduction

Regional income disparities have long been phenomena in Canada. These disparities may be due not only to cost-of-living differences across characterized regions within the country, but also to differences in human-capital related demographic characteristics. An examination of the extent in magnitude of differences among regional-income distributions—particularly that of low income—often has important policy implications, as it is the basis for evaluating existing provincial welfare policies and for developing re-distributive policies of the federal government of Canada, such as the fiscal equalization grants. As a result, how to obtain a reliable and robust regional profile is a key aspect of policy formulation, and it therefore deserves close scrutiny.

In Canada, a regional low-income profile is not officially constructed, but it can often be obtained by constructing low-income measures—such as the headcount ratio or low-income gap—based on Statistics Canada's low-income cutoffs (LICOs), as in Figure 1.[1] However, questions have always been raised concerning the robustness of the results, particularly when measurements of the welfare function and poverty itself are controversial. The use of such cutoffs is subject to arbitrary choices, with respect to the proportion of spending on necessities and what constitutes necessities. It can be argued that any revision of these standards would lead to completely different geographic distribution of low income (see, for example, Ravallion and Bidani 1994).

This paper provides a robust way to compare regional low-income profiles in Canada without arbitrarily specifying a low-income line. The empirical analysis is motivated by the theory of stochastic dominance, which can be used in examining the rankings of income distributions with multiple-poverty criteria for a wide range of low-income lines.[2] That is, by comparing the cumulative distribution functions of income between two regions, one may judge whether the choice of low-income line affects the conclusion about ranking. This avoids using one single low-income line to make a comparison.

The paper is also motivated by the long-standing debate in Canada over the meaning of the term 'poverty.' This is due, in part, because there is no consensus on the choice of scaling factors to make the income distributions comparable for poverty analysis. Such scaling factors include a price index that accounts for inflation, a spatial price index for cost-of-living differences and an equivalence scale that accounts for household composition. There is often criticism that Statistics Canada's LICOs provide no satisfactory index for cost-of-living across regions. Policy makers and researchers have suggested using other measures to supplement the LICOs, including the low-income measures (LIMs)—which place emphasis on a relative concept—and the market-basket measure (MBM)—which tackles cost/price-differences in necessities for a total of

1. See also, for example, Lee 2000 and National Council of Welfare 2004; comparisons based on measures other than headcount or poverty gap can also be seen, for example, in Osberg and Xu 1999, who compare inter-provincial poverty in Canada using the modified Sen index of poverty intensity.

2. See, for example, Atkinson 1987, Foster and Shorrocks 1988, Jenkins and Lambert 1997 and Zheng 2000. Statistical issues on stochastic dominance can be found, for example, in Bishop, Formby and Smith 1991, Bishop, Formby and Thistle 1992, Kaur, Prakasa Rao and Singh 1994 and Anderson 1996 for discussing test of the ordinates of the curves, and in Davidson and Duclos 2000 for deriving the limiting distribution of estimated ordinates. Empirical studies using the technique of stochastic dominance can be seen, for example, in Madden and Smith 2000, Sahn 2001 and Anderson 2003. Canadian studies that apply a similar method to make a robust regional comparison include Xu and Osberg 1998, who developed a testing procedure for deprivation dominance with application to four regions in Canada.

48 urban centres and community sizes in the 10 provinces.[3] Low-income statistics (e.g., headcounts or low-income gaps) are bound to differ among the underlying scaling factors chosen. The important question, however, is to know by how much they differ. To answer this question, tests of stochastic dominance are also performed, based on different choices of assumptions made to defining income or low income. These include the choice of spatial price deflators, equivalence scales and an absolute or a relative concept. Statistical inferences for stochastic dominance are used to account for sampling variations.

In Section 2, we briefly summarize the low-income measures used and explain the stochastic dominance approach. In Section 3, we go on to describe the data and the definition of income. Section 4 provides an empirical illustration on how tests of the stochastic dominance are implemented, using real data from two provinces—Newfoundland and Labrador and Ontario. The results for all provinces are presented and discussed in Section 5, and the conclusions are then summarized in Section 6.

2 Low-income measures and stochastic dominance

By far the most widely used low-income measure is the headcount index, which simply measures the proportion of the population that is counted as living in low income. In this paper, we also include two other measures—the low-income gap and the squared low-income gap—in the analysis. These three measures belong to the Foster-Greer-Thorbecke class of poverty indices (see Foster, Greer and Thorbecke 1984). These measures may be written generally as

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{g_i}{z}\right)^\alpha, (\alpha \geq 0)$$

$$g_i = \max(z - y_i, 0)$$

where y_i is the value of per-adult equivalent income for the i-th person, and N represents the total population. Then g_i is the income shortfall—the gap between individual income and the low-income threshold—for individual i for a given low-income line z, and α is a measure of the sensitivity of the index to the income shortfalls themselves. Foster, Greer and Thorbecke (1984) interpret this parameter as an indicator of "aversion to poverty" because it gives greater emphasis to the poorest poor as α becomes larger. When α=0, P_0 is simply the headcount ratio; when α=1, P_1 is the poverty or low-income gap index, defined by the mean distance below the low-income line, where the mean is formed over the entire population, with the non-poor counted as having a zero low-income gap; and when α=2, P_2 (the squared low-income gap) is called the poverty or low-income severity index, because it is sensitive to inequality among the poor. Although, in general, P can be derived for any desired order, it becomes more difficult to interpret for larger α. Therefore, we restrict our discussion to the first three measures in this paper.

3. That is, the low-income measure is a fixed percentage (50%) of median needs-adjusted income. The market-basket measures, on the other hand, are estimated costs of a specific basket of goods and services related to food, clothing and footwear, shelter and transportation; and the costs are calculated for 29 community sizes in the 10 provinces and another 19 specific urban centres. See Human Resources Development Canada (2003) for details.

Note that it is useful to consider the low-income gap (P_1) and squared low-income gap (P_2) measures in addition to the commonly used headcount index (P_0), since the latter is neither monotonic nor distribution-sensitive. For example, a small transfer of income from a rich person to a very poor person may not change the headcount ratios, while this welfare improvement is reflected in a reduction of both the P_1 and P_2 measures. Also, a transfer of income from a poor person to a poorer person may not alter the P_0 and P_1, but it lessens inequality among the poor, and it is reflected in a reduction of the P_2 measure.[4] Policies on low-income reduction may be more appropriately targeted—whether reducing headcount or reducing severity of the poor—when outcomes of all three measures are understood.

Stochastic dominance and statistical inference

To make a robust low-income comparison for two income distributions, it is important to check whether low income in one distribution always dominates the other, no matter what low-income line is used. This requirement can be addressed by drawing on the technique of stochastic dominance, which is based on the comparisons of cumulative distribution functions (CDFs). Consider two distributions of incomes with CDF, F_A and F_B, respectively. Let

$D^1(x) = F(x)$, and

$D^s(x) = \int_0^x D^{(s-1)}(y)dy$ for any integer $s \geq 2$.

Distribution B is said to dominate distribution A stochastically at order s if $D_A^s(x) \geq D_B^s(x)$ for all low-income lines over the domain of interest. The graph of $D^1(x)$ is often referred to as the *low-income incidence curve* because it is traced out as one plots the headcount index on the vertical axis and the low-income line on the horizontal axis, allowing the low-income line to vary from zero to an arbitrarily selected maximum low-income line z_{max}. The graph of $D^2(x)$ is usually regarded as the *low-income deficit curve*, and $D^3(x)$ as the *low-income severity curve*.

Since two density curves may be very close to each other, there is a need to assess whether the difference between them is statistically significant. Studies have suggested various hypotheses that could be used in a testing procedure for stochastic dominance.[5] In this paper, we employ a null hypothesis of non-dominance of B over A, $H_0 : D_B^s(x) - D_A^s(x) \geq 0$ for all x over a domain of interest. If the null is rejected, then it legitimately infers the dominance of B over A. It can be shown that such a hypothesis is asymptotically bounded by the nominal level of a test based on the standard normal distribution. The test is based on the minimum t-statistic approach proposed by Kaur, Prakasa Rao and Singh (1994) for the null against the alternative of dominance. Similar to Kaur, Prakasa Rao and Singh, we calculate the t statistic for each value of x that is observed in the sample. We reject the null of non-dominance and accept the alternative of dominance if the minimum t statistic is significant at the 5% level. This procedure is often interpreted as an

4. That is, the FGT measures satisfy Sen's 1976 Monotonicity Axiom for $\alpha > 0$, and the Transfer Axiom for $\alpha > 1$.

5. See Davidson and Duclos 2000, 2006 for a more in-depth discussion about different hypothesis testing.

intersection-union test because dominance of B over A can only occur if the t statistic for the difference in any ordinate pair is significant.[6]

In reality, it is often possible that the two distributions of incomes may cross within the range of interest (as in Figure 2).[7] In this case, there are two closed intervals observed and two minimum t statistics are obtained with the opposite sign. If both minimum t statistics are significant at a certain level, we can conclude dominance of B over A between $[z^B_{min}, z^B_{max}]$ and also dominance of A over B between $[z^A_{min}, z^A_{max}]$. As a result, dominance relation over the entire domain is uncertain or undetermined. If it occurs, one may resolve the problem by looking for higher order stochastic dominance, which focuses on a measure that places more weights on the poorer persons, to help reach a clear conclusion. In the case of second-order dominance, it is to compare the low-income deficit curve, which can be traced out by calculating the areas under the cumulative distribution function (low-income incidence curve), and plot its value against the low-income line. Similarly, third-order dominance can be employed by comparing the low-income severity curve (the areas under the low-income deficit curve). If this fails to reject the null of non-dominance up to third-order condition, we declare that the two distributions of income are not comparable.

In many circumstances, especially in the discussion of welfare economics, interests of poverty dominance are often restricted to over an arbitrarily defined interval $[z_{min}, z_{max}]$, as suggested in Atkinson 1987. In Figure 2, for example, first-order stochastic dominance of A by B is not found over the whole range of the income distribution, while dominance may be obtained over the restricted domain $[z^B_{min}, z^B_{max}]$. The comparisons, therefore, refer only to a 'partial,' rather than a complete, ordering of the distributions. Davidson and Duclos (2006) also point out some rationales for focusing on testing of restricted dominance and they emphasize that such focus would avoid comparisons over areas where there is too little information.

In fact, it may be more informative to estimate the thresholds for dominance (or restricted dominance) relations between regions. Since, in this paper, t statistics are calculated at each value of x over the domain of interest, it is possible to find the estimates of lower/upper thresholds in which interval one distribution stochastically dominates the other. To do this, we must first choose a range of low-income lines where t statistics are calculated. Then, the minimum t statistic is used to test the null of non-dominance at significance of 5% level. If there does exist only dominance of B over A for the range of interest, we declare dominance and report the estimates of lower/upper thresholds to which range the distribution B ranks over A. However, if there is a failure to reject the null, either because the minimum t is not significant or because there exists a reverse case (dominance of A over B) at another interval within the range of interest, we declare no dominance and search for higher order tests.

In this paper, t statistics are calculated mainly for two different ranges of interest over the lower part of the income distribution: full domain (\$0+, \$20,000); and, restricted domain (\$5,000, \$20,000). In either case, we make an arbitrary choice of maximum possible low-income line z_{max} =\$20,000 of equivalent income (see definition below), while the lower limit is set to \$5,000 of equivalent income for the restricted model.

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6. This is opposed to a union-intersection test (Bishop, Formby and Smith 1991, for example), where dominance of B over A can be declared if there exists at least one x where $D_A(x)$-$D_B(x)$ is rejected.

7. That is, we have both positive and negative t statistics at significance level.

3 Data and definitions of income and low-income lines

The data are from the Survey of Labour and Income Dynamics (SLID 2000). The sample includes everybody in the survey, and the family is defined as the economic family. In 2000, a total of 76,846 individuals are included, with Ontario constituting the largest sample (n=23,130) and Prince Edward Island (P.E.I.) the smallest (n=2,225). Income refers to total economic family income after government transfers and after taxes. In order to make the income distributions among regions comparable in real terms, income is family-needs adjusted (by an equivalence scale) and also spatial-price adjusted (by a set of cost-of-living deflators). Income-after-adjustments refers to equivalent income. For the base-case model, adjustments are made through scaling factors used for the calculation of the low-income cutoffs (LICOs).[8] By using equivalent income, it is similar to saying that the 35 LICOs are standardized into one single cutoff, with the baseline case set to one person living in a metropolitan area in a population size of 500,000 or above.

While low-income comparisons are made conditional on prior choice of scaling factors used to compute equivalent income, there is, however, no consensus on the choices of such factors. It is often argued that the cost-of-living index used for the LICOs is not satisfactory because it only differentiates prices among five community sizes, without taking into account the inter-provincial and city-specific differences in prices. Also, the LICOs apply a unique equivalence scale to adjust for family composition that is not commonly used in the literature. It is highly possible that a change in such underlying factors may modify the shape of income distributions and, therefore, may alter dominance results.

To examine whether dominance relations are robust to different scaling factors chosen, tests of dominance are also evaluated separately for equivalent income, based on two other equivalence scales—the square root of family size and the modified OECD scales[9]—that are widely used in the literature, and also based on an alternative cost-of-living index that was recently developed for the calculation of the market basket measure (MBM).[10] It is noteworthy the MBM is a federal–provincial–territorial-funded low-income measure calculating the costs of standard of consumption for a fine detail of 48 regions in Canada, including 29 rural/urban areas across provinces and 19 specific urban centres.[11] Although the MBM is not designed to measure price differences in general, such costs of baskets across finer regions, nevertheless, provide a good proxy for spatial differences in prices.

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8. That is, the equivalence scale for the calculation of the low-income cutoff (LICO) is 1 for people living alone; 1.217 for families of 2; 1.516 for families of 3; 1.891 for families of 4; 2.153 for families of 5; 2.388 for families of 6; and 2.623 for families of >=7. The scaling factor used in the low-income cutoff to adjust prices to its large-city equivalent (population 500,000 and above) is 1.529 for those in rural areas; 1.336 in urban areas of population <30000; 1.197 in urban areas of 30,000 to 99,999; and 1.182 in urban areas of 100,000 to 499,000.

9. The OECD-modified scale assigns a value of 1 to the first household member, 0.5 to each additional adult member and 0.3 to each child.

10. The other potential price indices across regions is the consumer price index (CPI), which measures price changes by comparing, through time, the cost of a fixed basket of commodities. The CPI is calculated for the 10 provinces and for an additional 16 urban centres.

11. See Human Resources Development Canada 2003 for more details.

Furthermore, particularly in low-income comparisons across time or across countries/regions, it is often more desirable to view low income in relative terms, as the low-income line is defined as some proportion of median or average income in respective time periods or regions. In other words, it allows for different low-income lines (z_A, z_B) for different income distributions.[12] For example, by setting the low-income line as a proportion of the provincial median income, it assumes that the appropriate community for reference is at the provincial level, not at the national level. It should be noted that this is not an issue of appropriate cost-of-living adjustment. Although 'standards of living or consumption' may vary across regions, due to differences in relative prices, they may also vary because of differences in tastes and also the availability of particular resources. The choice between relative and absolute lines, therefore, entails value judgments. In this paper we do not take a stand on the appropriate choice between these, but it is interesting to see whether or not the rankings of low income are sensitive to the choice of relative or absolute low-income lines.

Finally, analyses in the paper are weighted by the SLID cross-sectional weights, which not only compensate for non-response, but also make proper adjustments for complex survey designs to ensure that estimates on relevant population characteristics respect population totals from sources other than the survey.

4 An illustration: Newfoundland and Labrador and Ontario

Before showing the overall results, this section illustrates a comparison of low income for two provinces—Newfoundland and Labrador and Ontario—using the technique described above. Comparisons for other pairs of provinces are examined in a similar fashion. In Figure 3, we draw the two cumulative distribution functions (CDFs) for Newfoundland and Labrador and Ontario, respectively, where income is needs/region-price adjusted. The low-income cutoff (LICO) headcount rates can be obtained by drawing a standardized LICO line ($15,352) on the x axis. The corresponding y values confirm the information in Figure 1 that the headcount low-income rate is 13.2% in Newfoundland and Labrador and 10.8% in Ontario. However, more importantly, Figure 3 immediately reveals the drawback of the LICO because the answer to the question "Where is low income greater?" crucially depends on where the low-income line is drawn. Indeed, rank order, in this comparison, may lead to a complete reverse outcome when the low-income line is set to below $10,000 of equivalent income.

Tests of stochastic dominance over the full domain of low-income distribution

The task here is therefore to draw statistical inferences to test whether low income differs significantly between two regions. Tests of stochastic dominance are first conducted covering the full spectrum of the lower-end income distribution (i.e., for all possible values of low-income lines between 0+ and $20,000). It should be emphasized that t statistics are calculated at each value of x observed in the sample. For illustration purposes, we only show a grid of 20 low-income lines, which lie from $1,000 to $20,000 at intervals of $1,000, in Table 1. The estimated

12. The use of relative poverty lines may further complicate the testing procedure, as the calculation of sampling variances for estimates of relative poverty measures now includes a stochastic component of the poverty line, which needs to be estimated from samples at the same time (see Preston 1995, Zheng 2001) for detailed discussion about inference for poverty measures with relative poverty line). In this paper, for simplicity, the sampling variations of estimated poverty lines are ignored.

headcount ratios—along with their asymptotic standard errors—for both provinces as well as the t statistics of the difference $\hat{D}_A^0(x) - \hat{D}_B^0$ for each of these 20 points are presented.[13] At 5% significance level, Table 1 shows that Newfoundland and Labrador has a lower headcount ratio for all x less than $8,000 (the estimated threshold is $8,416); while Ontario dominates Newfoundland and Labrador for low-income lines above $13,000 (the estimated threshold is $12,366).[14] Since the two distributions crossed within the range of interest and the minimum t statistics show that both provinces dominate each other over some areas of x at significance level, a first-order stochastic dominance cannot therefore be concluded.

Given that there is no clear conclusion for a first-order test, we search for a second-order dominance, which focuses on the low-income gap measure. Figure 4 shows the low-income deficit curves where—for any given poverty line x—the y value represents the mean proportionate low-income gap (as defined by the percentage of x). That is, for instance, a point (y, x)=(0.06, 20,000) in a deficit curve indicates that the mean distance below the low-income line is $1,200 (20000*.06) for the population if the low-income line is set at $20,000. Similar to incidence curves, the two deficit curves still intersected at x around $15,000. The t statistics based on the minimum t ratio at the 5% level show that Newfoundland and Labrador's second order dominates Ontario's for x below $11,424, while Ontario dominates Newfoundland and Labrador for $x \geq \$18,470$. As a result, second-order dominance is not obtained.

In a search for third-order dominance, we plot low-income severity curves in Figure 5, where the y value is the mean proportionate squared low-income gap. This measure takes into account inequality among the poor by giving unequal weights to the poor population, where the weights are the proportionate low-income gaps themselves. By squaring the gap, low-income comparison between these two provinces has become more clear as the Newfoundland and Labrador curve now lies below that of Ontario for all $x \leq \$14,684$ at the 5% level, and no reversal is found for all other x values $\leq \$20,000$. This is not surprising, because this measure gives more weight to the poorest of the poor, and Ontario appears to have a higher proportion of poor people at the bottom of the distribution. As a result, we conclude that Newfoundland and Labrador has less low income than does Ontario, as Newfoundland and Labrador's third-order dominates Ontario over the domain ($0+, $14,684).

The exercise also reveals the sensitivity of low-income measures used. In fact, it shows that no poverty-measure ordering (see Zheng 2000) can be found when LICO is used. That is, under LICO, Ontario is considered to have less low income than Newfoundland and Labrador in terms of headcount rates at the 5% level; the ordering then becomes ambiguous in the low-income gap measure and a reverse ordering is obtained in the squared low-income gap measure.

13. Generally, for un-weighted data, one can use a reference by Kakwani 1993 to calculate the asymptotic standard errors for the FGT poverty measures. However, the Survey of Labour and Income Dynamics has a complicated design; this paper, therefore, follows a reference (Duclos and Araar 2006, chap. 16) to take into account the sampling design of the survey.

14. Bootstrap estimates of standard errors (not shown) for the lower/upper thresholds are computed based on 50 replications from the original sample with replacement.

Tests of stochastic dominance over restricted domain

Notice that dominance relations from above may not hold if the range of interest is redefined over a restricted domain (z_{min}, z_{max}), rather than over the full range of the lower-end income distribution (0, z_{max}). Recall that the two distributions crossed at around $10,000. At the 5% level, Newfoundland and Labrador dominates Ontario for x less than $8,416 and Ontario dominates Newfoundland and Labrador for x greater than $12,366. This implies that one can actually obtain a very different conclusion that Ontario's first order dominates Newfoundland and Labrador's for all $x \geq \$12,366$, if the lower limit of interest is set to over $8,416.

The challenge, however, is to pick up a reasonable lower limit, where t statistics are to be calculated. In this paper we consider an arbitrary choice of $5,000. Even though this value does not really make sense for a 'minimal survival poverty line,' we choose it because the value is small enough to make our comparisons more robust, but it is large enough to avoid problems of small observations and measurement errors that usually prevail in the lower tail of the distribution. Given the restricted domain of interest, the testing result (the minimum t statistic at the 5% level) still concludes that Newfoundland and Labrador dominates Ontario stochastically at the third order condition over ($5,000, $14,684) with a reported lower threshold censored at $5,000.

The simple illustration above demonstrates that the rankings of low income based on commonly used LICO indicators are not robust, because such comparisons only rank the headcount at one low-income line, and a contradictory result may occur when different low-income lines are chosen. Using the stochastic-dominance approach, this example shows that the two distributions of income can be ranked over a wide range of possible low-income lines. We also show that ranking of distributions may alter when different domains of interest are assumed. In fact, since the t statistics are calculated at each point in the sample, the lower/upper thresholds for dominance can be obtained at a certain level of significance using the minimum t-statistic approach. It allows us to check until we reach which minimum/maximum values of the low-income line we can go to in order to rank low income across two provinces.

Does the choice of cost-of-living deflator matter?

In Figures 6 to 8 we repeat the same exercise as above, but now we use the market-basket measure (MBM)-based cost-of-living index as scaling factors for equivalent income.[15] The LICO equivalence scale is still used to adjust for family composition. Contrary to previous findings, a dominance relation cannot be established between Newfoundland and Labrador and Ontario when the range of interest covers all possible values between zero and $20,000. It is clear from graphs that the two density curves crossed for all first-, second- and third-order conditions and both provinces' low incomes dominate each other at different intervals of the distribution. Low-income severity curves, for instance, show that Ontario's third order dominates Newfoundland and Labrador's for low-income lines above $14,358 at the 5% level, while also showing a complete reverse outcome for low-income lines below $9,091. This reveals that the rankings of low income exhibit sensitivity to the choice of scaling factors relating to cost of living. It is, however, noteworthy that the two low-income incidence curves cross at a much lower value of x

15. That is, we first arbitrarily select a base region (i.e., Toronto in this example), and then the cost-of-living scaling factors for other regions can be obtained by the ratio of costs of basket for Toronto and costs of basket for the region in comparison. As a result, equivalent incomes are adjusted to a Toronto-equivalent basis.

when the MBM cost-of-living index is used. Indeed, a reverse outcome will not happen at the 5% level until $x \leq \$6{,}000$. Therefore, one may obtain restricted first-order dominance of Ontario over Newfoundland and Labrador for low-income lines between $8,430 and $20,000 if the range of interest is set to above $6,000.

Does the choice of equivalence scale matter?

A similar robustness argument can be applied to the choice of equivalence scale. To examine this, we re-compute equivalent income using two other equivalence scales: the 'squared root of family size' and 'modified OECD scale,' respectively.[16] At the significance of the 5% level, the results (not shown) greatly resemble those in the base case. It concludes third-order dominance of Newfoundland and Labrador over Ontario if test statistics are calculated over the full domain. For restricted dominance, it concludes that Ontario's first-order dominates Newfoundland and Labrador's for low-income lines above $10,471 (compared with $12,366 in the base-case model). This suggests that the rankings of low income are generally less sensitive—at least in this illustration—to the choice of equivalence scales.

Relative concept of low income

How does switching from an absolute to a relative low-income concept affect the rankings of low income? To answer this question, we normalize equivalent income for each individual by dividing respective provincial median income. Income is still-needs adjusted and prices adjusted, using LICO factors. The maximum possible low-income line is set at 70% of the provincial median income. For a restricted case, t statistics are computed for a range of low-income lines from 15% to 70% of the estimated median income, on the basis that they are considered the reasonable lower and upper limits to the low-income lines. Figure 9 reveals that the two CDF lines exhibit quite similar patterns, except for the lower portion of the distribution. The minimum t statistic from Table 4 indicates that Newfoundland and Labrador's first order dominates Ontario's for low-income lines below 34.2% of respective median income. There is no need to look for higher order conditions because no reverse outcome is found in the range of interest at significance level.

Compared with the base-case results, this exercise shows sensitivity to the choice of absolute or relative low-income lines. In the latter case, Ontario never stochastically dominates Newfoundland and Labrador for any range of low-income lines. It is also worth noting that low-income rankings, based on relative concepts, are less affected by the choice of cost-of-living deflator (results not shown) because individuals are now compared with the standard (% of median) in the province of residence. Thus, inter-provincial price differences are irrelevant and only differences in intra-provincial prices matter.

5 Comparing regional low income in Canada

Table 5 reports the estimates of headcount ratios (and asymptotic standard errors) for the 10 provinces and for selected low-income lines, varying from $4,000 to $20,000 of equivalent income. Provinces are ranked from left to right—most low income to least low income—

16. Income is still spatial price-adjusted using the low-income cutoff cost-of-living index.

according to their headcount rates.[17] It reveals that the rankings of low income are sensitive to where the low-income line is drawn. In fact, provinces in Western Canada experience higher headcount rates for low-income lines below $8,000. When the lines are set to $10,000 or above, low-income orderings change dramatically: headcount rate now becomes significantly higher in Quebec and Newfoundland and Labrador (N.L.), while Saskatchewan, Alberta and Ontario all experience a drop in headcount rankings.

The results for dominance relations by the 10 provinces (a total of 45 pairs) are presented in Tables 6 to 11: t statistics are calculated at each value of x observed in the sample, and the minimum t-ratio approach is used to test for the null of non-dominance. A value '1' in the cell indicates that column first-order dominates the row, and the two parentheses below indicate the lower/upper thresholds in which the column province dominates the row province in low income within the boundary at the 5% significance level. Similarly, a '2' represents a second-order dominance, and a '3' illustrates third-order dominance. When a dominance relation cannot be found up to the third-order condition, a 'Z' is marked to indicate that low income between the two provinces cannot be ranked.[18] The overall low-income rankings are obtained from the simple method of pair-wise comparisons and the rankings are displayed in ascending order (1, 2, 3...) representing the highest to lowest levels of low income. That is, for any given two provinces, the one with more total cases of dominance is considered to have less low income. If head-to-head comparisons between two provinces cannot be determined, and both provinces have the same total cases of dominance over other provinces, then both are tied in the low-income rankings.

In Table 6, t statistics are calculated over the full spectrum of the lower-part income distribution (i.e., low-income lines from $0+ to $20,000). For reference, the commonly used low-income cutoff (LICO)-headcount ratios are also reported in the table. Overall, Table 6 shows that rank order can be determined and the lower/upper limits for dominance can be obtained in 41 out of the 45 comparisons, up to third-order condition. In 2000, British Columbia (B.C.) had the highest level of low income, as B.C. was first-order stochastically dominated by all other provinces for a wide range of low-income lines.[19] The ordering is then followed by Manitoba and Quebec, Saskatchewan/Alberta, Ontario and the Atlantic Provinces, with New Brunswick (N.B.) and Prince Edward Island (P.E.I.) dominating all other provinces at the first-order condition. Interestingly, such rankings are not necessarily in accordance with the LICO-headcount rates. For instance, N.L. has a significantly higher LICO-headcount rate than Ontario, Alberta and Saskatchewan, indeed N.L. dominates these provinces in low income at a higher order. It is because N.L. has a relatively smaller proportion of 'very poor' people among the low-income population compared with other provinces.

This use of information over the distribution of income helps rank the two provinces that appeared to be statistically indistinguishable in a LICO comparison. For instance, one cannot

17. Rankings for the estimates of poverty-gap ratio and squared poverty-gap ratio are offered in Appendix Tables A1 and A2, respectively.

18. There are two cases when a Z is marked. First we fail to reject the null of non-dominance everywhere in the domain of interest (i.e., the two distributions coincide together). Second there are at least two closed intervals in the domain of interest and the minimum t statistic is significant in both intervals, but with a different sign (i.e., the two distributions crossed). In theory, dominance results may be obtained at higher orders (>3) condition. For practical reasons, we limit tests up to the third-order condition.

19. Note that Quebec only dominates British Columbia over a relatively limited range ($0+, $8,641) at the first order. However, the range of dominance extends to ($0+, $17,884) at the second-order condition.

rank low income between Ontario and Saskatchewan, based on the LICO-headcount rates, because the difference at this particular point is statistically insignificant. However, more marked regional differences may be discovered when we look at a wide range of low-income lines. Using the stochastic dominance approach, we can conclude that Ontario's first order dominates Saskatchewan stochastically over a restricted domain ($17,651, $20,000+).

Although first-order dominance is commonly seen in most cells in Table 6, there are six comparisons where dominance relations must be determined at a higher order condition, and there are also four cases where no clear conclusion can be obtained up to the third-order condition. This may occur because the two curves are not differentiable, or because the two curves crossed over the range of interest. In the latter case, it is possible that the dominance relation may change if a restricted domain—which now excludes the crossing point—is focused. Indeed, literature has suggested focusing on restricted dominance, instead of unrestricted dominance, because there may be a sampling issue at the tails of the distributions. In addition, from a soc elfare perspective, it might be sensible to impose a minimum income that is needed for an individual to perform normally in a given society to meet certain ethical principles (see Davidson and Duclos 2006 for more discussion).

For this reason, we introduce a reasonable lower limit ($5,000) and t statistics are computed over the restricted domain ($5,000, $20,000) in Table 7. We refer this table to 'the base-case' model. Surprisingly, rank-order changed only slightly compared with Table 6. The only exceptions are Quebec and Manitoba, where rank order is reversed. Manitoba was third-order dominated by Quebec in Table 6, but it now dominates Quebec at first order over domain ($13,167, $14,629). The reversal occurred because in Manitoba there are relatively more deprived people living below $5,000 and these people were ignored when focusing on restricted domain. It is reasonable to believe that low-income ranking may be in a complete different order as domain of interest becomes more restricted.

In Table 8, we further limit t statistics to be calculated over an even more restricted range from $10,000 to $20,000. Now N.L. shows more low income, as its rankings move from seventh place in the base-case model to fourth place. Rank reversals are observed between N.L. and three other provinces—Saskatchewan, Alberta and Ontario. It is not surprising, because N.L. overall has relatively more people in the lower part of the income distribution—but very few at the bottom—compared with the three aforementioned provinces. Testing based on a more restricted domain, therefore, reduces comparative advantage for N.L. and results in a higher ranking in low income. Furthermore, two comparisons that failed to reject the null of non-dominance in the base-case model—Nova Scotia (N.S.)/N.L. and Ontario/N.S.—now show dominance relations at first-order condition. The overall low-income rankings, therefore, can be ordered more precisely.

It should be emphasized that the interpretation of low-income rankings needs to be supplemented with the range of dominance that is estimated in the tables. In some cases, such as the comparison with B.C., dominance relation is very robust for a wide range of low-income lines. In other cases, such as the N.B./Ontario comparison, it only concludes that N.B.'s first order dominates that of Ontario for a very restricted domain ($14,606, $15,904). The two provinces are virtually not distinguishable when comparing low-income lines outside the limit.

Sensitivity analyses

It is emphasized that the long standing debate on poverty often involves discussions on choosing different scaling factors to define equivalent income and also on issues about choosing absolute or relative low-income lines. The remaining subsection, therefore, examines the robustness of low-income rankings to the choice of some underlying assumptions—namely, equivalence scales, cost-of-living factors and relative low-income lines.

Table 9 shows tests of dominance for which equivalent income is calculated using 'square-root family size' instead of a LICO-equivalence scale. In order to attribute rank change to the choice of equivalence scale, income is still price adjusted, using the LICO cost-of-living index. In comparing with the base-case results, Table 9 shows that low-income rankings are virtually insensitive to the choice of equivalence scale. Rank order remained exactly the same for 44 out of 45 comparisons with minor changes over domain of dominance. The only difference is N.S./N.L., where dominance relation cannot be determined in the base-case model but it is clear now that N.S.'s first order dominates that of N.L. for low-income lines ($13,864, $18,871). Nevertheless, it is important that no rank reversal occurred to the choice of equivalence scales.[20]

Next, we examine how the choice of spatial price factor affects geographical distribution of low income. This is relevant, especially when no satisfactory spatial cost-of-living index is available for Canada. It is well documented that using different indices for spatial-price differences could reverse rankings for poverty measures (see, for examples, Ravallion and Bidani 1994, Jolliffe 2004). This is also the case in Canada. Compared with the base-case results, Table 10 reveals that dominance relations change considerably when the market basket measure (MBM)-based price index is used.

Except for B.C., where low income remained the highest among the nation for a wide range of low-income lines, rank order for other provinces reshuffled. Overall, low income becomes more serious in the Atlantic provinces and less so in the Prairie provinces and Ontario. It is striking that Quebec, which was ranked second place in low income from the base-case model, has now become the province with the least low income. On the other hand, the use of the MBM-price index significantly increases low income for P.E.I.—from the least low income to the third highest among provinces. Indeed, a complete reversal of low-income ranking is observed in 21 out of 45 cells, particularly for relating comparisons to Quebec, P.E.I. and Manitoba. For instance, eight out of nine Quebec-involved comparisons turned to the opposite result.

Despite the reshuffling, the overall low-income rankings become more obvious because now we only reject the null of non-dominance for two cells, compared with four in the base-case model. The four comparisons (e.g., N.S./N.L.), in which rank-order could not be determined in Table 7, now show clear dominance relations at the first order for some range of low-income lines. Nevertheless, the use of the MBM-price index also changed relations for two cells (i.e., N.S./P.E.I. and Saskatchewan/N.L.) from dominance to non-comparability, up to the third-order condition.

20. The results are robust, even when the other equivalence scale (i.e., the modified OECD scale) is used (not shown). Tests of poverty dominance based on the OECD scale show great resemblance to those obtained from the 'square root family size' equivalence scale.

Comparing Table 7 with Table 10, dominance relations remained the same for only 18 out of 45 comparisons (with one cell changed order condition). The tests of dominance are robust for B.C., regardless of the choice of cost-of-living index. However, it is striking that as many as 21 cells reached a complete reversal of ranking. It is also interesting that such reversals are not observed equally across provinces. Rather, they mainly concentrate among comparisons relating to Quebec, P.E.I., Manitoba and Alberta, as 19 out of the 21 reversals involve these provinces. The results reflect significant inter-provincial differences in the costs of necessities, information that is masked in the LICO cost-of-living index; and, such costs of MBMs are considerably lower in certain provinces, such as Quebec and Manitoba. This, of course, raises issues about how the MBM thresholds were calculated and how to keep them updated over time. Also, it is debatable whether there is a need to differentiate a regional basket at such a detailed level, given that people can move freely. The answer to these questions, however, is beyond the scope of this paper.

Finally, in Table 11, we examine low-income dominance using relative low-income lines. In the cases of cross-country/region comparison, it is often more desirable to view low income as a relative term. People may feel deprived or excluded, simply because they have fewer resources relative to the average standard of the society in which they reside, not necessary because their income/consumption level is below an absolute subsistence of living. When adopting a relative low-income concept, low-income lines are allowed to vary by different income distributions across provinces, with low-income lines set to a proportion of the provincial median income.

In order to compare with the base-case model, tests statistics are calculated at each normalized value of x for a range from 15% to 70% of provincial median income.[21] Overall, Table 11 shows that B.C. still ranks first in low income, even with relative lines. The ordering then follows with Ontario, the Prairie provinces, Quebec and the Atlantic provinces. The overall rankings show some resemblance to the base-case model as the rankings of B.C. and the Atlantic provinces all stay in the same places as in Table 7. In fact, about 33 out of 35 comparisons relating to these provinces keep the same dominance results. Switching from an absolute to a relative low-income concept, however, has greater impact on low-income comparisons between Ontario, Quebec and the Prairie provinces. It is striking that a reverse outcome is observed in 8 out of 10 comparisons among these provinces. Ontario now ranks second highest in low income—compared with second place in the base-case model—while low income becomes relatively lower for Quebec and Manitoba, as their rankings dropped a couple of places compared with Table 7.

It is reasonable to infer that rank reversal is more likely to happen when comparing provinces in which median income differs markedly. A typical case is Ontario, where median-equivalent income is much higher than that of other provinces. The use of relative low-income lines, therefore, places more people into low income in Ontario in the sense of relative deprivation. This also propels Ontario's rankings in low income toward the top among all provinces. On the other hand, relative deprivation is of less concern in provinces like Quebec, where median income is considerably lower. It is also noteworthy that two cells—N.S./Ontario and P.E.I./N.B.—that failed to reject the null of non-dominance before, now display first-order dominance over a reasonable range of relative low-income lines. For Saskatchewan/Alberta and N.S./N.L., their low-income rankings are still undetermined up to third-order condition when relative low-income lines are used.

21. The values of 15% and 70% of the provincial median income are roughly close to the restricted domain ($5,000, $20,000) defined in the base-case model.

6 Conclusions

It is often argued that low-income rankings are not robust. Using the stochastic dominance approach, this paper provides a robust way to compare regional low income without arbitrarily selecting a low-income line. We reach the following conclusions.

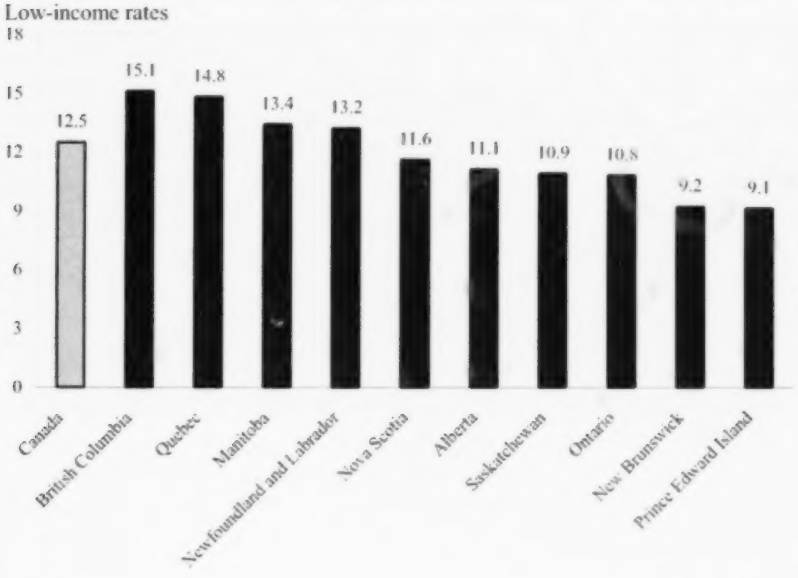
First, by applying dominance tests for the FGT class of poverty indices—up to third order condition—between regions, we show that, in most cases, dominance relations can be determined and regional low income can be ordered for a wide range of low-income lines.

Second, it reveals that low-income rankings based on commonly used Canadian low-income cutoffs (LICOs) are not robust. An illustration for Newfoundland and Labrador (N.L.) and Ontario shows that the opposite outcomes can be concluded when different low-income lines are chosen. Also, the LICOs only compare the headcount at one low-income line, while ignoring the depth and intensity of low income. The methodology used in this paper offers a more informative and revealing understanding of the distribution of low income. For instance, it is found that N.L.'s low income dominates that of Alberta at the second order, despite that the former has a significantly higher LICO headcount rate than the latter.

Third, in 2000 British Columbia (B.C.) ranked the highest in low income, as B.C. was first-order dominated by all other provinces. Quebec and Manitoba were in the second and third places in low-income rankings, respectively, with Saskatchewan/Alberta fourth, Ontario sixth, and N.L./Nova Scotia seventh. New Brunswick and Prince Edward Island were provinces with the least low income in Canada, as their low-incomes dominate all other provinces at first order.

Furthermore, this paper also demonstrates that dominance results are sensitive to assumptions made to defining equivalent income and the concept of income. Generally, dominance results are robust to the choice of equivalence scales, while rank reversal occurs when alternative cost-of-living deflators are used. Switching from an absolute to a relative low-income concept has virtually no effect on low-income rankings for B.C. and the Atlantic provinces but not in the case for other provinces. The findings urge closer scrutiny on underlying assumptions. Finally, the answer to the question "Where is low income greatest in Canada?" goes to B.C., at least for 2000. The result is robust for all scales, regardless of the choices of poverty lines, cost-of-living factors, equivalence scales and an absolute or a relative low-income concept.

Figure 1
Regional low-income rates based on low-income cutoffs, after-tax



Source: Statistics Canada, Income in Canada 2006.

Figure 2
Crossing of low-income incidence curves

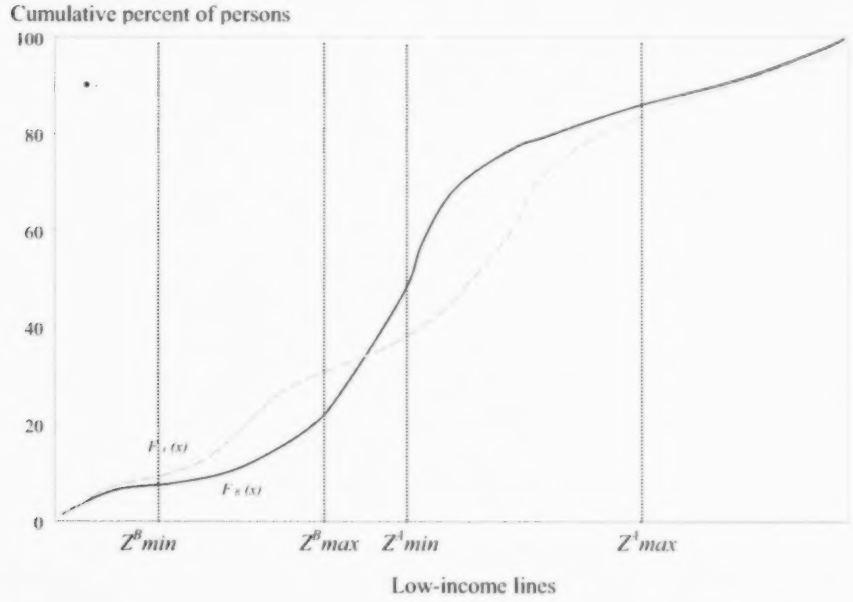
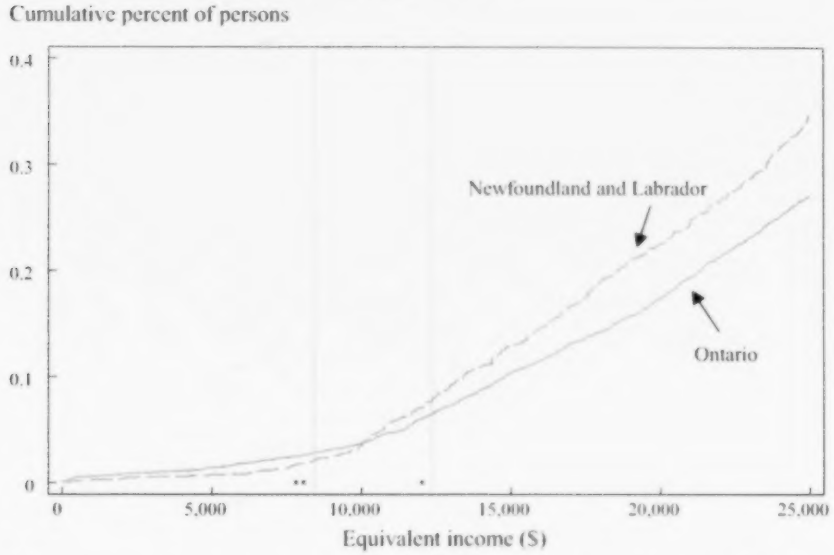
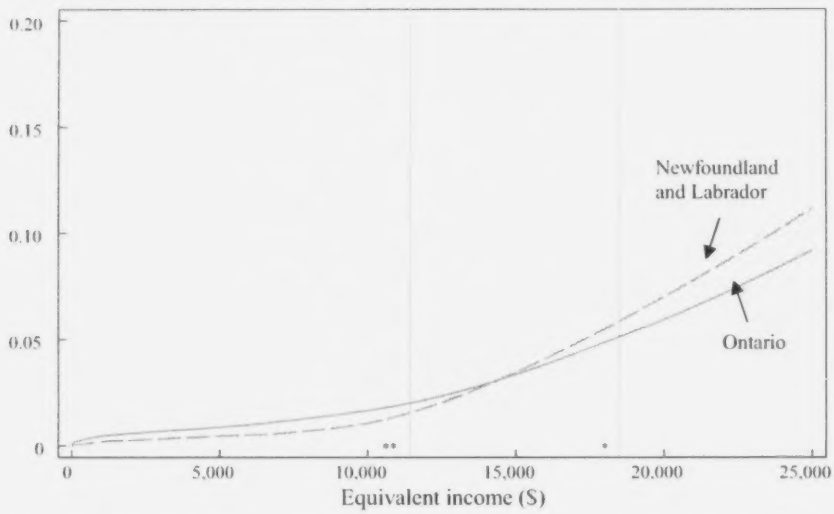


Figure 3
Low-income incidence curves, the low-income cutoff-based equivalence scale and cost-of-living, 2000



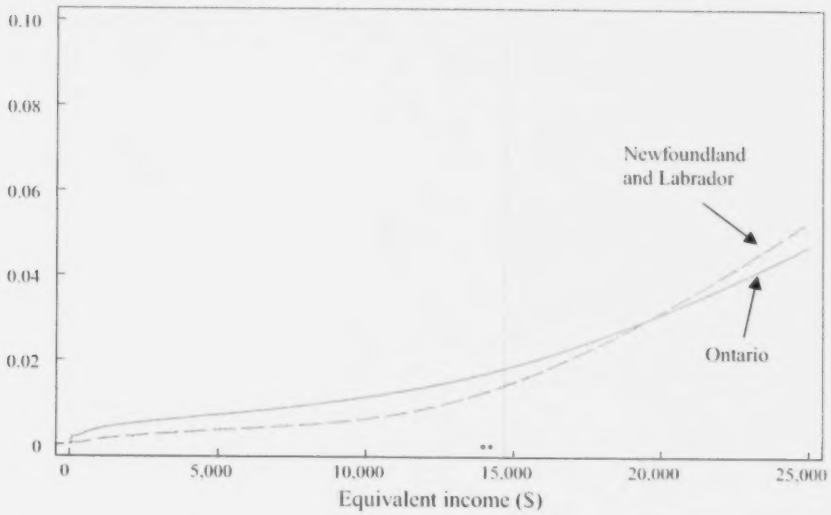
* Lower upper bound of stochastic dominance (Ontario over Newfoundland and Labrador) at 5% level (=$12,366–$20,000+)
** Lower upper bound of stochastic dominance (Newfoundland and Labrador over Ontario) at 5% level (=$0+–$8,416)
Note: Standardized low-income cutoff line=$15,352 and maximum low-income line=$20,000.
Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Figure 4
Low-income deficit curves, the low-income cutoff-based equivalence scale and cost-of-living, 2000



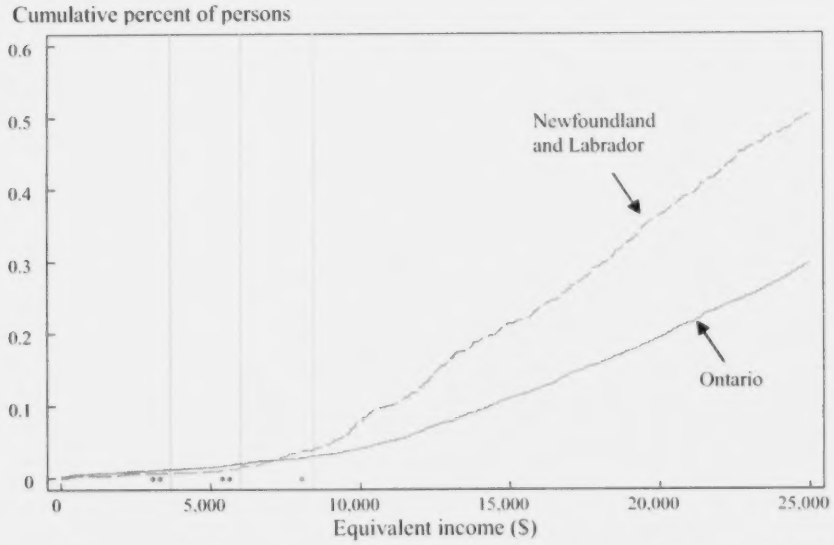
* Lower upper bound of stochastic dominance (Ontario over Newfoundland and Labrador) at 5% level (=$18,470/=$20,000+)
** Lower/upper bound of stochastic dominance (Newfoundland and Labrador over Ontario) at 5% level (=$0+/=$11,424)
Note: Standardized low-income cutoff line=$15,352 and maximum low-income line=$20,000.
Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Figure 5
Low-income severity curves, the low-income cutoff-based equivalence scale and cost-of-living, 2000



* Lower/upper bound of stochastic dominance (Ontario over Newfoundland and Labrador) at 5% level (not available)
** Lower/upper bound of stochastic dominance (Newfoundland and Labrador over Ontario) at 5% level (=$0+/=$14,684)
Note: Standardized market basket measure line=$14,460 and maximum low-income line=$20,000.
Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

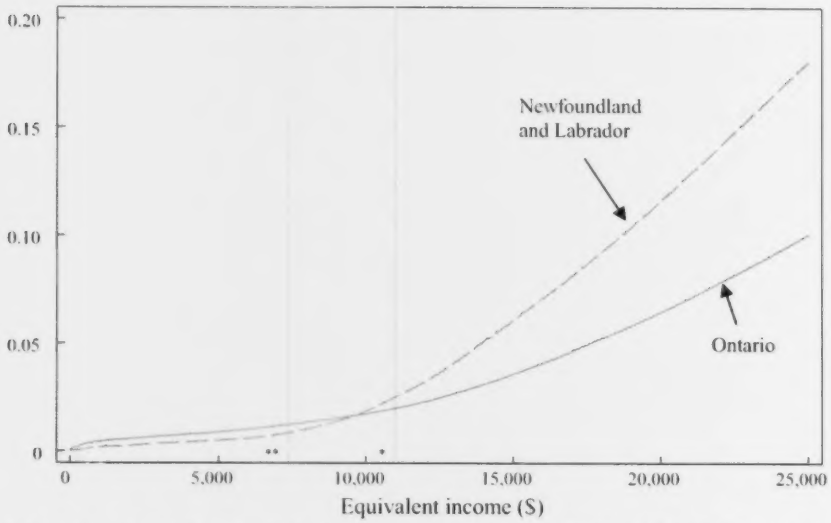
Figure 6
Low-income incidence curves, the market basket measure-based cost-of-living,[1] 2000



* Lower/upper bound of stochastic dominance (Ontario over Newfoundland and Labrador) at 5% level (=$8,430/=$20,000+)
** Lower/upper bound of stochastic dominance (Newfoundland and Labrador over Ontario) at 5% level (=$3,650/=$6,000)
1. The low-income cutoff-based equivalence scale is still applied to adjust family size.
Note: Standardized market basket measure line=$14,460 and maximum low-income line=$20,000.
Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Figure 7
Low-income deficit curves, the market basket measure-based cost-of-living,[1] 2000

Mean proportionate low-income gap



* Lower upper bound of stochastic dominance (Ontario over Newfoundland and Labrador) at 5% level (=$10,976/$20,000+)

** Lower upper bound of stochastic dominance (Newfoundland and Labrador over Ontario) at 5% level (=$0+/=$7,362)

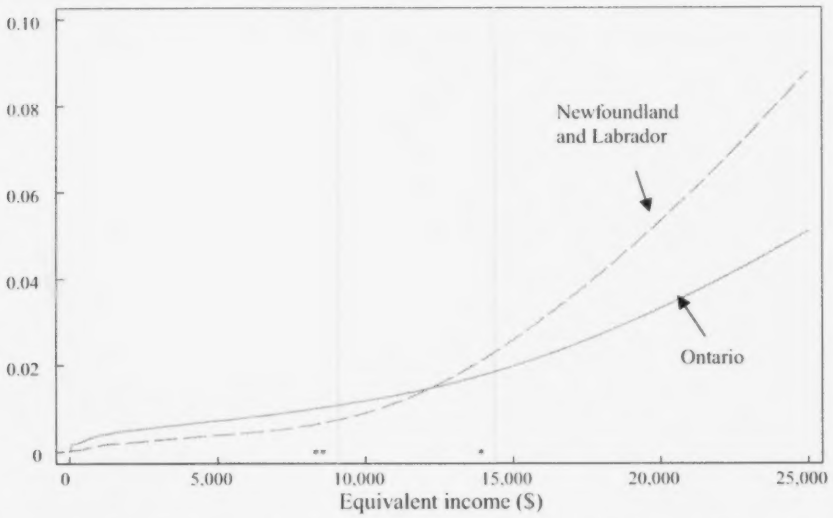
1. The low-income cutoff-based equivalence scale is still applied to adjust family size.

Note: Standardized market basket measure line=$14,460 and maximum low-income line=$20,000.

Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Figure 8
Low-income severity curves, the market basket measure-based cost-of-living,[1] 2000

Mean proportionate squared low-income gap



* Lower/upper bound of stochastic dominance (Ontario over Newfoundland and Labrador) at 5% level (-$14,358/-$20,000+)

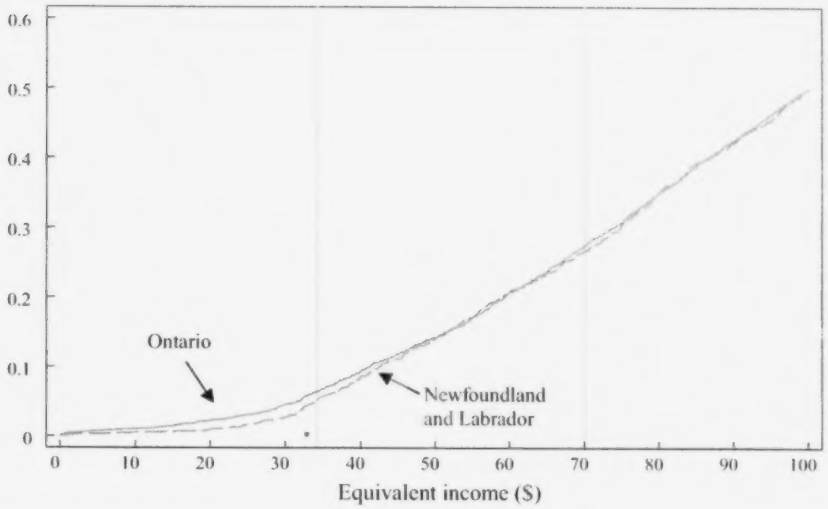
** Lower/upper bound of stochastic dominance (Newfoundland and Labrador over Ontario) at 5% level (-$0+/-$9,091)

1. The low-income cutoff-based equivalence scale is still used.

Note: Standardized market basket measure line=$14,460 and maximum low-income line=$20,000.

Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Figure 9
Low-income incidence curves for normalized equivalent income,[1] 2000



* Lower upper bound of stochastic dominance (Newfoundland and Labrador over Ontario) at 5% level (=%0+/=%34.2)

1. Equivalence income is normalized by dividing median income of respective province. Scaling factors are based on the low-income cutoff equivalence scale and cost-of-living factors. Test of dominance is evaluated at every x value in the sample between 15% and 70% of the provincial median income.

Notes: Median equivalent income in Newfoundland and Labrador=$31,491; in Ontario=$35,950. Maximum low-income line=70% of provincial median income.

Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table 1
Difference between low-income incidence curves for selected low-income lines, Newfoundland and Labrador and Ontario, 2000

	Low-income incidence curves (asymptotic standard error)			
Equivalent income ($)	Newfoundland and Labrador	Ontario	Difference	*t* statistics
1,000	0.003	0.006	-0.003	-1.752[1]
	(0.002)	(0.001)	(0.002)	
2,000	0.004	0.008	-0.004	-2.023[1]
	(0.002)	(0.001)	(0.002)	
3,000	0.006	0.010	-0.004	-1.866[1]
	(0.002)	(0.001)	(0.002)	
4,000	0.006	0.011	-0.005	-2.045[1]
	(0.002)	(0.001)	(0.002)	
5,000	0.008	0.014	-0.007	-2.363[2]
	(0.002)	(0.001)	(0.003)	
6,000	0.008	0.018	-0.010	-3.451[2]
	(0.002)	(0.001)	(0.003)	
7,000	0.012	0.022	-0.010	-2.936[2]
	(0.003)	(0.001)	(0.003)	
8,000	0.018	0.026	-0.008	-1.937[1]
	(0.004)	(0.002)	(0.004)	
9,000	0.024	0.032	-0.007	-1.597
	(0.004)	(0.002)	(0.005)	
10,000	0.036	0.038	-0.002	-0.345
	(0.005)	(0.002)	(0.006)	
11,000	0.057	0.047	0.009	1.360
	(0.006)	(0.002)	(0.007)	
12,000	0.070	0.060	0.010	1.308
	(0.007)	(0.002)	(0.008)	
13,000	0.093	0.073	0.020	2.264[1]
	(0.008)	(0.003)	(0.009)	
14,000	0.110	0.088	0.022	2.340[2]
	(0.009)	(0.003)	(0.009)	
15,000	0.129	0.104	0.024	2.455[2]
	(0.009)	(0.003)	(0.010)	
16,000	0.146	0.115	0.031	2.937[2]
	(0.010)	(0.003)	(0.010)	
17,000	0.167	0.132	0.035	3.184[2]
	(0.010)	(0.003)	(0.011)	
18,000	0.191	0.142	0.049	4.172[2]
	(0.011)	(0.004)	(0.012)	
19,000	0.211	0.158	0.053	4.401[2]
	(0.011)	(0.004)	(0.012)	
20,000	0.226	0.174	0.052	4.183[2]
	(0.012)	(0.004)	(0.012)	

1. Significance of difference at 5% level (1.645)
2. Significance of difference at 1% level (2.326)

Notes: Equivalent income is needs-adjusted using low-income cutoff (LICO) equivalence scale, and spatial prices-adjusted using LICO-based deflator. Baseline group is unattached individuals living in urban (500,000) area.
t statistics are calculated at each value of *x* in the sample, while only 20 selected points are reported in this table.
Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table 2
Difference between low-income deficit curves (relative low-income gaps) for selected low-income lines, Newfoundland and Labrador and Ontario, 2000

	Low-income deficit curves (asymptotic standard error)			
Equivalent income ($)	Newfoundland and Labrador	Ontario	Difference	*t* statistics
1,000	0.002	0.005	-0.003	-2.312 [1]
	(0.001)	(0.001)	(0.001)	
2,000	0.003	0.006	-0.003	-2.250 [1]
	(0.001)	(0.001)	(0.001)	
3,000	0.003	0.007	-0.004	-2.166 [1]
	(0.001)	(0.001)	(0.002)	
4,000	0.004	0.008	-0.004	-2.150 [1]
	(0.002)	(0.001)	(0.002)	
5,000	0.005	0.009	-0.004	-2.214 [1]
	(0.002)	(0.001)	(0.002)	
6,000	0.005	0.010	-0.005	-2.419 [2]
	(0.002)	(0.001)	(0.002)	
7,000	0.006	0.011	-0.006	-2.637 [2]
	(0.002)	(0.001)	(0.002)	
8,000	0.007	0.013	-0.006	-2.715 [2]
	(0.002)	(0.001)	(0.002)	
9,000	0.009	0.015	-0.006	-2.629 [2]
	(0.002)	(0.001)	(0.002)	
10,000	0.011	0.017	-0.006	-2.437 [2]
	(0.002)	(0.001)	(0.002)	
11,000	0.014	0.019	-0.005	-1.963 [1]
	(0.002)	(0.001)	(0.003)	
12,000	0.018	0.022	-0.004	-1.332
	(0.003)	(0.001)	(0.003)	
13,000	0.023	0.025	-0.002	-0.768
	(0.003)	(0.001)	(0.003)	
14,000	0.029	0.029	-0.001	-0.200
	(0.003)	(0.001)	(0.003)	
15,000	0.035	0.034	0.001	-0.273
	(0.003)	(0.001)	(0.004)	
16,000	0.041	0.038	0.003	0.671
	(0.004)	(0.001)	(0.004)	
17,000	0.048	0.043	0.004	1.057
	(0.004)	(0.001)	(0.004)	
18,000	0.055	0.049	0.006	1.444
	(0.004)	(0.002)	(0.004)	
19,000	0.063	0.054	0.009	1.850 [1]
	(0.004)	(0.002)	(0.005)	
20,000	0.070	0.060	0.011	2.199 [1]
	(0.005)	(0.002)	(0.005)	

1. Significance of difference at 5% level (1.645)
2. Significance of difference at 1% level (2.326)

Notes: Equivalent income is needs-adjusted using low-income cutoff (LICO) equivalence scale, and spatial prices-adjusted using LICO-based deflator. Baseline group is unattached individuals living in urban (500,000) area.

t statistics are calculated at each value of *x* in the sample, while only 20 selected points are reported in this table.

Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table 3
Difference between low-income severity curves (squared relative low-income gaps) for selected low-income lines, Newfoundland and Labrador and Ontario, 2000

	Low-income severity curves (asymptotic standard error)			
Equivalent income ($)	Newfoundland and Labrador	Ontario	Difference	*t* statistics
1,000	0.001	0.004	-0.003	-2.577[2]
	(0.000)	(0.000)	(0.001)	
2,000	0.002	0.005	-0.003	-2.327[2]
	(0.001)	(0.001)	(0.001)	
3,000	0.003	0.006	-0.003	-2.267[1]
	(0.001)	(0.001)	(0.001)	
4,000	0.004	0.006	-0.003	-2.232[1]
	(0.001)	(0.001)	(0.001)	
5,000	0.004	0.007	-0.004	-2.229[1]
	(0.001)	(0.001)	(0.002)	
6,000	0.004	0.008	-0.004	-2.271[1]
	(0.001)	(0.001)	(0.002)	
7,000	0.004	0.009	-0.004	-2.374[2]
	(0.002)	(0.001)	(0.002)	
8,000	0.005	0.009	-0.005	-2.480[2]
	(0.002)	(0.001)	(0.002)	
9,000	0.005	0.010	-0.005	-2.550[2]
	(0.002)	(0.001)	(0.002)	
10,000	0.006	0.011	-0.005	-2.575[2]
	(0.002)	(0.001)	(0.002)	
11,000	0.007	0.012	-0.005	-2.524[2]
	(0.002)	(0.001)	(0.002)	
12,000	0.009	0.014	-0.005	-2.372[2]
	(0.002)	(0.001)	(0.002)	
13,000	0.010	0.015	-0.005	-2.146[1]
	(0.002)	(0.001)	(0.002)	
14,000	0.013	0.017	-0.004	-1.864[1]
	(0.002)	(0.001)	(0.002)	
15,000	0.015	0.019	-0.004	-1.542
	(0.002)	(0.001)	(0.002)	
16,000	0.018	0.021	-0.003	-1.211
	(0.002)	(0.001)	(0.002)	
17,000	0.021	0.023	-0.002	-0.873
	(0.002)	(0.001)	(0.003)	
18,000	0.024	0.026	-0.002	-0.538
	(0.002)	(0.001)	(0.003)	
19,000	0.028	0.028	-0.001	-0.197
	(0.003)	(0.001)	(0.003)	
20,000	0.031	0.031	0.000	0.136
	(0.003)	(0.001)	(0.003)	

1. Significance of difference at 5% level (1.645)
2. Significance of difference at 1% level (2.326)

Notes: Equivalent income is needs-adjusted using low-income cutoff (LICO) equivalence scale, and spatial prices-adjusted using LICO-based deflator. Baseline group is unattached individuals living in urban (500,000) area.

t statistics are calculated at each value of x in the sample, while only 20 selected points are reported in this table.

Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table 4
Difference between low-income incidence curves for selected relative low-income lines, Newfoundland and Labrador and Ontario, 2000

Percentage of median income in respective province	Low-income incidence curves (asymptotic standard error) Newfoundland and Labrador	Ontario	Difference	*t* statistics
5	0.003	0.008	-0.004	-2.325[1]
	(0.001)	(0.001)	(0.002)	
10	0.006	0.011	-0.005	-2.201
	(0.002)	(0.001)	(0.002)	
15	0.007	0.015	-0.008	-3.121[2]
	(0.002)	(0.001)	(0.003)	
20	0.009	0.023	-0.014	-4.454[2]
	(0.002)	(0.002)	(0.003)	
25	0.018	0.032	-0.014	-3.266[2]
	(0.002)	(0.002)	(0.004)	
30	0.028	0.046	-0.018	-3.511[2]
	(0.002)	(0.002)	(0.005)	
35	0.057	0.068	-0.012	-1.628
	(0.006)	(0.003)	(0.007)	
40	0.086	0.093	-0.008	-0.901
	(0.008)	(0.003)	(0.008)	
45	0.112	0.119	-0.007	-0.711
	(0.009)	(0.003)	(0.009)	
50	0.142	0.142	-0.001	-0.046
	(0.010)	(0.004)	(0.010)	
55	0.171	0.171	-0.000	-0.031
	(0.011)	(0.004)	(0.011)	
60	0.208	0.207	0.001	0.079
	(0.011)	(0.004)	(0.012)	
65	0.237	0.238	-0.001	-0.086
	(0.012)	(0.004)	(0.013)	
70	0.268	0.275	-0.007	-0.519
	(0.012)	(0.005)	(0.013)	
75	0.303	0.308	-0.006	-0.397
	(0.013)	(0.005)	(0.014)	
80	0.352	0.350	0.002	0.110
	(0.013)	(0.005)	(0.014)	
85	0.394	0.390	0.004	0.259
	(0.014)	(0.005)	(0.015)	
90	0.423	0.426	-0.003	-0.203
	(0.014)	(0.005)	(0.015)	
95	0.455	0.463	-0.009	-0.595
	(0.014)	(0.005)	(0.015)	
100	0.500	0.500	0.001	0.030
	(0.014)	(0.005)	(0.015)	

1. Significance of difference at 5% level (1.645)
2. Significance of difference at 1% level (2.326)

Notes: Equivalent income is needs-adjusted using low-income cutoff (LICO) equivalence scale, and spatial prices-adjusted using LICO-based deflator. Equivalent incomes are normalized by dividing median of respective province.

t statistics are calculated at each value of *x* in the sample, while only 20 selected points (expressed as % of the provincial median income) are reported in this table.

Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table 5
Headcount low-income rankings for selected low-income lines, 2000

	Most low income			Medium low income				Least low income		
Equivalent income ($)	1	2	3	4	5	6	7	8	9	10
4,000	B.C.	Man.	Sask.	Ont.	Alta.	P.E.I.	Que.	N.B.	N.S.	N.L.
	0.023	0.014	0.014	0.011	0.010	0.010	0.009	0.009	0.008	0.006
	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)
6,000	B.C.	Sask.	Alta.	Man.	Ont.	Que.	N.S.	N.B.	P.E.I.	N.L.
	0.032	0.022	0.022	0.021	0.018	0.016	0.015	0.012	0.011	0.008
	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)
8,000	B.C.	Alta.	Sask.	Que.	Man.	Ont.	N.S.	N.B.	P.E.I.	N.L.
	0.044	0.035	0.033	0.033	0.032	0.026	0.024	0.022	0.021	0.018
	(0.004)	(0.004)	(0.004)	(0.002)	(0.004)	(0.002)	(0.003)	(0.003)	(0.005)	(0.004)
10,000	B.C.	Que.	Man.	Alta.	Sask.	N.S.	Ont.	N.L.	N.B.	P.E.I.
	0.066	0.061	0.053	0.052	0.049	0.039	0.038	0.036	0.033	0.030
	(0.005)	(0.003)	(0.005)	(0.004)	(0.005)	(0.004)	(0.002)	(0.005)	(0.004)	(0.006)
12,000	B.C.	Que.	Man.	N.L.	Alta.	Sask.	Ont.	N.S.	N.B.	P.E.I.
	0.093	0.089	0.075	0.070	0.065	0.061	0.060	0.059	0.051	0.048
	(0.006)	(0.004)	(0.005)	(0.007)	(0.005)	(0.005)	(0.002)	(0.005)	(0.005)	(0.007)
14,000	B.C.	Que.	N.L.	Man.	Alta.	N.S.	Sask.	Ont.	N.B.	P.E.I.
	0.130	0.122	0.110	0.106	0.093	0.092	0.090	0.088	0.079	0.068
	(0.006)	(0.004)	(0.009)	(0.006)	(0.006)	(0.006)	(0.006)	(0.003)	(0.006)	(0.008)
16,000	B.C.	Que.	Man.	N.L.	Alta.	N.S.	Sask.	Ont.	N.B.	P.E.I.
	0.163	0.159	0.148	0.146	0.125	0.125	0.121	0.115	0.105	0.094
	(0.007)	(0.005)	(0.007)	(0.010)	(0.006)	(0.007)	(0.007)	(0.003)	(0.007)	(0.010)
18,000	Que.	B.C.	N.L.	Man.	Sask.	N.S.	Alta.	Ont.	N.B.	P.E.I.
	0.196	0.193	0.191	0.188	0.160	0.160	0.151	0.142	0.14	0.134
	(0.005)	(0.007)	(0.011)	(0.008)	(0.008)	(0.008)	(0.007)	(0.004)	(0.008)	(0.011)
20,000	B.C.	Man.	Que.	N.L.	N.S.	Sask.	Alta.	N.B.	Ont.	P.E.I.
	0.246	0.245	0.241	0.226	0.202	0.199	0.187	0.178	0.174	0.166
	(0.008)	(0.009)	(0.006)	(0.012)	(0.009)	(0.009)	(0.008)	(0.009)	(0.004)	(0.012)

Notes: B.C. = British Columbia; Man. = Manitoba; Sask. = Saskatchewan; Alta. = Alberta; Ont. = Ontario; P.E.I. = Prince Edward Island; Que. = Quebec; N.B. = New Brunswick;
N.S. = Nova Scotia; N.L. = Newfoundland and Labrador.
Equivalent income is needs-adjusted using low-income cutoff (LICO) equivalence scale, and spatial prices-adjusted using LICO-based deflator. Asymptotic standard errors are in parentheses.
Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table 6

Low-income dominance, test statistics are computed for low-income lines between zero and $20,000

Low income rankings	Province	Low-income cutoff headcount rates	B.C.	Man.	Que.	Sask.	Alta.	Ont.	N.L.	N.S.	N.B.	P.E.I.
				1	1	1	1	1	1	1	1	1
1	B.C.	15.1		(10,900)	(0+)	(3,576)	(0+)	(0+)	(0+)	(0+)	(0+)	(0+)
				(14,817)	(8,641)	(20,000)	(20,000)	(20,000)	(13,334)	(20,000)	(20,000)	(20,000)
					3	1	1	1	1	1	1	1
2	Man.	13.4			(0+)	(14,380)	(14,390)	(8,196)	(1,251)	(7,976)	(7,480)	(8,229)
					(1,615)	(20,000)	(20,000)	(20,000)	(10,332)	(20,000)	(20,000)	(20,000)
						2	2	1	1	1	1	1
3	Que.	14.8				(13,812)	(13,711)	(7,545)	(5,301)	(6,691)	(6,298)	(7,545)
						(20,000)	(20,000)	(20,000)	(12,535)	(20,000)	(20,000)	(20,000)
								1	2	1	1	1
4	Sask.	10.9					Z	(17,651)	(4,313)	(5,852)	(5,053)	(5,097)
								(20,000)	(12,997)	(9,845)	(11,585)	(16,227)
								1	2	1	1	1
4	Alta.	11.1						(7,094)	(5,328)	(4,671)	(4,790)	(4,816)
								(11,559)	(13,233)	(10,421)	(12,378)	(17,123)
									3		1	1
6	Ont.	10.8							(0+)	Z	(14,606)	(11,557)
									(14,684)		(15,904)	(16,264)
											1	1
7	N.L.	13.2								Z	(10,825)	(10,697)
											(20,000)	(20,000)
											1	1
7	N.S.	11.6									(14,130)	(14,875)
											(18,151)	(20,000)
9	N.B.	9.2										Z
9	P.E.I.	9.1										

Notes: Notes: B.C. = British Columbia; Man. = Manitoba; Sask. = Saskatchewan; Alta. = Alberta; Ont. = Ontario; P.E.I. = Prince Edward Island; Que. = Quebec; N.B. = New Brunswick; N.S. = Nova Scotia; N.L. = Newfoundland and Labrador.

1 in the cell indicates that the column first-order dominates the row at 5% level; similar interpretation for 2 (second-order) and 3 (third-order) dominance. The first (second) parenthesis indicates the lower-bound (upper-bound) of stochastic dominance, at 5% significance level, at given order condition. The upper bound threshold is censored at $20,000. Z indicates that dominance relation can not be found up to third-order condition. Test of dominance is evaluated at every x value in the sample between zero and $20,000, where x is equivalent income based on low-income cutoff equivalence scale and cost-of-living deflator.

Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table 7
Low-income dominance, test statistics are computed for low-income lines between $5,000 and $20,000

Low income rankings	Province	Low-income cutoff headcount rates	B.C.	Que.	Man.	Sask.	Alta.	Ont.	N.L.	N.S.	N.B.	P.E.I.
				1	1	1	1	1	1	1	1	1
1	B.C.	15.1		(5,000)	(10,900)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)
				(8,641)	(14,817)	(20,000)	(20,000)	(20,000)	(13,334)	(20,000)	(20,000)	(20,000)
					1	2	2	1	1	1	1	1
2	Que.	14.8			(13,167)	(13,812)	(13,711)	(7,454)	(5,301)	(6,691)	(6,298)	(7,545)
					(14,629)	(20,000)	(20,000)	(20,000)	(12,535)	(20,000)	(20,000)	(20,000)
						1	1	1	1	1	1	1
3	Man.	13.4				(14,380)	(14,390)	(8,196)	(5,000)	(7,976)	(7,480)	(8,229)
						(20,000)	(20,000)	(20,000)	(10,332)	(20,000)	(20,000)	(20,000)
								1	2	1	1	1
4	Sask.	10.9					Z	(17,651)	(5,000)	(5,852)	(5,053)	(5,097)
								(20,000)	(12,997)	(9,845)	(11,585)	(16,227)
								1	2	1	1	1
4	Alta.	11.1						(7,094)	(5,328)	(5,000)	(5,000)	(5,000)
								(11,559)	(13,233)	(10,421)	(12,378)	(17,123)
									3		1	1
6	Ont.	10.8							(5,000)	Z	(14,606)	(11,557)
									(14,684)		(15,904)	(16,264)
											1	1
7	N.L.	13.2								Z	(10,825)	(10,697)
											(20,000)	(20,000)
											1	1
7	N.S.	11.6									(14,130)	(14,875)
											(18,151)	(20,000)
9	N.B.	9.2										Z
9	P.E.I.	9.1										

Notes: B.C. = British Columbia; Man. = Manitoba; Sask. = Saskatchewan; Alta. = Alberta; Ont. = Ontario; P.E.I. = Prince Edward Island; Que. = Quebec; N.B. = New Brunswick; N.S. = Nova Scotia; N.L. = Newfoundland and Labrador.
1 in the cell indicates that the column first-order dominates the row at 5% level; similar interpretation for 2 (second-order) and 3 (third-order) dominance. The first (second) parenthesis indicates the lower-bound (upper-bound) of stochastic dominance, at 5% significance level, at given order condition. The lower (upper) bound thresholds are censored at $5,000 and $20,000 respectively.
Z indicates that dominance relation can not be found up to third-order condition. Test of dominance is evaluated at every x value in the sample between $5,000 and $20,000, where x is equivalent income based on LICO equivalence scale and cost-of-living deflator.
Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table 8
Low-income dominance, test statistics are computed for low-income lines between $10,000 and $20,000

Low income rankings	Province	Low-income cutoff headcount rates	B.C.	Que.	Man.	N.L.	Sask.	Alta.	N.S.	Ont.	N.B.	P.E.I.
				2	1	1	1	1	1	1	1	1
1	B.C.	15.1		(10,000)	(10,900)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)
				(17,884)	(14,817)	(13,334)	(20,000)	(20,000)	(20,000)	(20,000)	(20,000)	(20,000)
					1	1	1	1	1	1	1	1
2	Que.	14.8			(13,167)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)
					(14,629)	(12,535)	(20,000)	(20,000)	(20,000)	(20,000)	(20,000)	(20,000)
						1	1	1	1	1	1	1
3	Man.	13.4				(10,000)	(14,380)	(14,390)	(14,493)	(10,000)	(10,000)	(10,000)
						(10,332)	(20,000)	(20,000)	(20,000)	(20,000)	(20,000)	(20,000)
							1	1	1	1	1	1
4	N.L.	13.2					(13,482)	(14,570)	(12,592)	(12,366)	(10,821)	(10,697)
							(20,000)	(20,000)	(20,000)	(20,000)	(20,000)	(20,000)
									2	1	1	1
5	Sask.	10.9						Z	(10,000)	(17,651)	(10,000)	(10,000)
									(13,080)	(20,000)	(11,585)	(16,227)
									1	1	1	1
5	Alta.	11.1							(10,000)	(10,000)	(10,000)	(10,000)
									(10,421)	(11,559)	(12,378)	(17,123)
										1	1	1
7	N.S.	11.6								(17,400)	(14,130)	(14,875)
										(20,000)	(18,151)	(20,000)
											1	1
8	Ont.	10.8									(14,606)	(11,557)
											(15,904)	(16,264)
9	N.B.	9.2										Z
9	P.E.I.	9.1										

Notes: B.C. = British Columbia; Man. = Manitoba; Sask. = Saskatchewan; Alta. = Alberta; Ont. = Ontario; P.E.I. = Prince Edward Island; Que. = Quebec; N.B. = New Brunswick; N.S. = Nova Scotia; N.L. = Newfoundland and Labrador.
1 in the cell indicates that the column first-order dominates the row at 5% level; similar interpretation for 2 (second-order) and 3 (third-order) dominance. The first (second) parenthesis indicates the lower-bound (upper-bound) of stochastic dominance, at 5% significance level, at given order condition. The lower (upper) bound thresholds are censored at $10,000 and $20,000 respectively. Z indicates that dominance relation can not be found up to third-order condition. Test of dominance is evaluated at every x value in the sample between $10,000 and $20,000, where x is equivalent income based on low-income cutoff equivalence scale and cost-of-living deflator.
Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table 9

Low-income dominance, test statistics are computed for low-income lines between $5,000 and $20,000, square-root family size equivalence scale

Low income rankings	Province	Low-income cutoff headcount rates	B.C.	Que.	Man.	Sask.	Alta.	Ont.	N.L.	N.S.	N.B.	P.E.I.
				1	1	1	1	1	1	1	1	1
1	B.C.	15.1		(5,000)	(9,988)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)
				(7,570)	(14,980)	(20,000)	(20,000)	(20,000)	(11,459)	(20,000)	(20,000)	(20,000)
					1	2	2	1	1	1	1	1
2	Que.	14.8			(14,283)	(13,006)	(12,452)	(7,332)	(5,000)	(6,298)	(5,804)	(6,793)
					(15,081)	(20,000)	(20,000)	(20,000)	(10,478)	(20,000)	(20,000)	(20,000)
						1	1	1	1	1	1	1
3	Man.	13.4				(13,855)	(11,883)	(7,970)	(5,000)	(8,899)	(5,000)	(7,469)
						(20,000)	(20,000)	(20,000)	(9,829)	(20,000)	(20,000)	(20,000)
								1	2	1	1	1
4	Sask.	10.9					Z	(17,158)	(5,000)	(5,885)	(5,000)	(5,000)
								(20,000)	(11,814)	(8,019)	(10,317)	(14,179)
								1	2	1	1	1
4	Alta.	11.1						(6,691)	(5,220)	(5,000)	(5,000)	(6,607)
								(10,299)	(11,754)	(8,287)	(10,557)	(16,179)
									3		1	1
6	Ont.	10.8							(5,000)	Z	(5,121)	(9,945)
									(13,107)		(7,126)	(13,991)
										1	1	1
7	N.L.	13.2								(13,864)	(10,470)	(9,813)
										(18,871)	(20,000)	(20,000)
											1	1
8	N.S.	11.6									(13,147)	(14,794)
											(17,488)	(19,450)
9	N.B.	9.2										Z
9	P.E.I.	9.1										

Notes: B.C. = British Columbia; Man. = Manitoba; Sask. = Saskatchewan; Alta. = Alberta; Ont. = Ontario; P.E.I. = Prince Edward Island; Que. = Quebec; N.B. = New Brunswick; N.S. = Nova Scotia; N.L. = Newfoundland and Labrador.

1 in the cell indicates that the column first-order dominates the row at 5% level; similar interpretation for 2 (second-order) and 3 (third-order) dominance. The first (second) parenthesis indicates the lower-bound (upper-bound) of stochastic dominance, at 5% significance level, at given order condition. The lower (upper) bound thresholds are censored at $5,000 and $20,000 respectively. Z indicates that dominance relation can not be found up to third-order condition. Test of dominance is evaluated at every x value in the sample between $5,000 and $20,000, where x is equivalent income based on low-income cutoff equivalence scale and cost-of-living deflator.

Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table 10
Low-income dominance, test statistics are computed for low-income lines between $5,000 and $20,000, the market basket measure cost-of-living deflators

Low income rankings	Model w market basket measure price-adjustment	Base-model rankings	B.C.	N.L.	P.E.I.	Sask.	N.S.	N.B.	Man.	Alta.	Ont.	Que.
				1	1	1	1	1	1	1	1	1
1	B.C.	B.C.		(5,000)	(5,000)	(6,710)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)
				(13,762)	(19,071)	(20,000)	(20,000)	(20,000)	(20,000)	(20,000)	(20,000)	(20,000)
					1		1	1	1	1	1	1
2	N.L.	Que.			(5,912)	Z	(5,912)	(5,912)	(8,764)	(9,368)	(8,430)	(7,310)
					(20,000)		(20,000)	(20,000)	(10,332)	(20,000)	(20,000)	(20,000)
						1		1	1	1	1	1
3	P.E.I.	Man.				(18,854)	Z	(19,924)	(16,788)	(13,833)	(13,833)	(16,659)
						(20,000)		(20,000)	(20,000)	(20,000)	(20,000)	(20,000)
							2	1	1	1	1	1
4	Sask.	Sask.					(7,731)	(5,231)	(15,018)	(13,387)	(13,241)	(14,701)
							(9,616)	(7,641)	(17,717)	(20,000)	(20,000)	(20,000)
								1	1	1	1	1
5	N.S.	Alta.						(13,264)	(12,355)	(11,480)	(9,502)	(12,247)
								(17,489)	(20,000)	(20,000)	(20,000)	(20,000)
									1	1	1	1
6	N.B.	Ont.							(18,921)	(13,336)	(15,091)	(17,259)
									(20,000)	(20,000)	(20,000)	(20,000)
										1	1	1
7	Man.	N.L.								(14,938)	(17,053)	(5,419)
										(20,000)	(20,000)	(7,191)
											1	2
8	Alta.	N.S.									(8,718)	(8,761)
											(9,484)	(10,885)
												2
9	Ont.	N.B.										(6,021)
												(10,369)
10	Que.	P.E.I.										

Notes: B.C. = British Columbia; Man. = Manitoba; Sask. = Saskatchewan; Alta. = Alberta; Ont. = Ontario; P.E.I. = Prince Edward Island; Que. = Quebec; N.B. = New Brunswick; N.S. = Nova Scotia; N.L. = Newfoundland and Labrador.

1 in the cell indicates that the column first-order dominates the row at 5% level; similar interpretation for 2 (second-order) and 3 (third-order) dominance. The first (second) parenthesis indicates the lower-bound (upper-bound) of stochastic dominance, at 5% significance level, at given order condition. The lower (upper) bound thresholds are censored at $5,000 and $20,000 respectively. Z indicates that dominance relation can not be found up to third-order condition. Test of dominance is evaluated at every x value in the sample between $5,000 and $20,000, where x is equivalent income based on low-income cutoff equivalence scale and market basket measure cost-of-living deflator.

Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table 11
Low-income dominance, test statistics are computed for relative low-income lines between 15% to 70% provincial median income

Low income rankings	Model w/ relative low income lines	Base-model rankings	B.C.	Ont.	Alta.	Sask.	Que.	Man.	N.L.	N.S.	N.B.	P.E.I.
				1	1	1	1	1	1	1	1	1
1	B.C.	B.C.		(15.0)	(31.4)	(31.1)	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)
				(70.0)	(70.0)	(70.0)	(70.0)	(70.0)	(42.5)	(70.0)	(70.0)	(70.0)
					1	1	1	1	1	1	1	1
2	Ont.	Que.			(53.7)	(34.3)	(59.3)	(36.1)	(15.0)	(32.4)	(23.2)	(23.3)
					(70.0)	(52.8)	(70.0)	(49.9)	(34.2)	(49.4)	(67.1)	(70.0)
							1	1	2	1	1	1
3	Alta.	Man.				Z	(15.0)	(21.8)	(15.6)	(15.0)	(15.0)	(14.6)
							(25.6)	(24.1)	(46.6)	(32.2)	(35.3)	(66.5)
							2	1	1	1	1	1
3	Sask.	Sask.					(19.7)	(21.3)	(15.0)	(17.8)	(15.3)	(15.47)
							(33.4)	(23.8)	(32.2)	(30.1)	(33.5)	(70.0)
								1	1	1	1	1
5	Que.	Alta.						(44.6)	(20.6)	(33.2)	(28.9)	(27.4)
								(48.6)	(34.2)	(37.5)	(54.5)	(70.0)
									2	2	1	1
6	Man.	Ont.							(15.0)	(15.0)	(31.0)	(28.0)
									(40.9)	(17.5)	(32.2)	(70.0)
											1	1
7	N.L.	N.L.								Z	(42.3)	(34.0)
											(62.9)	(70.0)
											1	1
7	N.S.	N.S.									(46.4)	(34.5)
											(47.5)	(70.0)
												1
9	N.B.	N.B.										(37.0)
												(70.0)
10	P.E.I.	P.E.I.										

Notes: B.C. = British Columbia; Man. = Manitoba; Sask. = Saskatchewan; Alta. = Alberta; Ont. = Ontario; P.E.I. = Prince Edward Island; Que.= Quebec; N.B. = New Brunswick; N.S. = Nova Scotia; N.L. = Newfoundland and Labrador.

1 in the cell indicates that the column first-order dominates the row at 5% level; similar interpretation for 2 (second-order) and 3 (third-order) dominance. The first (second) parenthesis indicates the lower-bound (upper-bound) of stochastic dominance, at 5% significance level, at given order condition. The lower (upper) bound thresholds are censored at 15% and 70% of the provincial median income respectively. Z indicates that dominance relation can not be found up to third-order condition. Test of dominance is evaluated at every x value in the sample between 15% and 70% of the provincial median income, where x is equivalent income based on the low-income cutoff equivalence scale and cost-of-living deflator.

Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Appendix

Table A.1
Low-income rankings (mean relative low income gaps) for selected low-income lines, year 2000

Equivalent	Most low income			Medium low income				Least low income		
income	1	2	3	4	5	6	7	8	9	10
4,000	B.C.	Man.	Sask.	Ont.	Que.	Alta.	P.E.I.	N.B.	N.S.	N.L.
	0.013	0.009	0.008	0.008	0.007	0.007	0.005	0.006	0.005	0.004
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
6,000	B.C.	Man.	Sask.	Ont.	Alta.	Que.	N.B.	P.E.I.	N.S.	N.L.
	0.018	0.012	0.011	0.010	0.010	0.008	0.007	0.007	0.007	0.005
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
8,000	B.C.	Sask.	Man.	Alta.	Ont.	Que.	N.S.	P.E.I.	N.B.	N.L.
	0.023	0.015	0.015	0.014	0.013	0.012	0.010	0.010	0.009	0.007
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
10,000	B.C.	Sask.	Man.	Alta.	Que.	Ont.	N.S.	N.B.	P.E.I.	N.L.
	0.029	0.021	0.021	0.020	0.019	0.017	0.014	0.013	0.013	0.011
	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)
12,000	B.C.	Que.	Man.	Sask.	Alta.	Ont.	N.S.	N.L.	N.B.	P.E.I.
	0.037	0.028	0.028	0.026	0.026	0.022	0.020	0.018	0.018	0.017
	(0.003)	(0.001)	(0.003)	(0.003)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)	(0.003)
14,000	B.C.	Que.	Man.	Alta.	Sask.	Ont.	N.L.	N.S.	N.B.	P.E.I.
	0.047	0.039	0.037	0.034	0.033	0.029	0.029	0.028	0.025	0.022
	(0.003)	(0.002)	(0.003)	(0.003)	(0.00.32)	(0.001)	(0.003)	(0.002)	(0.003)	(0.004)
16,000	B.C.	Que.	Man.	Alta.	Sask.	N.L.	Ont.	N.S.	N.B.	P.E.I.
	0.060	0.052	0.048	0.043	0.042	0.041	0.038	0.038	0.033	0.030
	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.001)	(0.003)	(0.003)	(0.004)
18,000	B.C.	Que.	Man.	N.L.	Alta.	Sask.	N.S.	Ont.	N.B.	P.E.I.
	0.073	0.066	0.061	0.055	0.054	0.053	0.050	0.049	0.043	0.040
	(0.004)	(0.002)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.004)
20,000	B.C.	Que.	Man.	N.L.	Sask.	Alta.	N.S.	Ont.	N.B.	P.E.I.
	0.088	0.081	0.077	0.070	0.065	0.065	0.062	0.060	0.054	0.051
	(0.004)	(0.002)	(0.004)	(0.005)	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)	(0.005)

Notes: B.C. = British Columbia; Man. = Manitoba; Sask. = Saskatchewan; Alta. = Alberta; Ont. = Ontario; P.E.I. = Prince Edward Island; Que. = Quebec; N.B. = New Brunswick; N.S. = Nova Scotia; N.L. = Newfoundland and Labrador.
Equivalent income is needs-adjusted using low-income cutoff (LICO) equivalence scale, and spatial prices-adjusted using low-income cutoff-based deflator. Asymptotic standard errors are in parentheses.
Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

Table A.2
Low-income rankings (mean relative low-income gaps squared) for selected low-income lines, year 2000

Equivalent	Most low income			Medium low income				Least low income		
income	1	2	3	4	5	6	7	8	9	10
4,000	B.C.	Man.	Ont.	Sask.	Alta.	Que.	N.B.	N.S.	P.E.I.	N.L.
	0.011	0.008	0.006	0.006	0.006	0.005	0.005	0.004	0.004	0.003
	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
6,000	B.C.	Man.	Sask.	Ont.	Alta.	Que.	N.B.	P.E.I.	N.S.	N.L.
	0.014	0.009	0.008	0.008	0.007	0.007	0.006	0.005	0.005	0.004
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
8,000	B.C.	Man.	Sask.	Ont.	Alta.	Que.	N.B.	N.S.	P.E.I.	N.L.
	0.017	0.011	0.010	0.009	0.009	0.008	0.007	0.007	0.007	0.005
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
10,000	B.C.	Man.	Sask.	Alta.	Ont.	Que.	N.S.	N.B.	P.E.I.	N.L.
	0.020	0.013	0.013	0.012	0.011	0.011	0.009	0.008	0.008	0.006
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
12,000	B.C.	Man.	Sask.	Alta.	Que.	Ont.	N.S.	N.B.	P.E.I.	N.L.
	0.024	0.017	0.016	0.015	0.015	0.014	0.011	0.010	0.010	0.009
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)
14,000	B.C.	Man.	Que.	Sask.	Alta.	Ont.	N.S.	N.B.	P.E.I.	N.L.
	0.029	0.021	0.020	0.020	0.019	0.017	0.014	0.013	0.013	0.013
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)
16,000	B.C.	Man.	Que.	Sask.	Alta.	Ont.	N.S.	N.L.	N.B.	P.E.I.
	0.034	0.026	0.026	0.024	0.024	0.021	0.019	0.018	0.017	0.016
	(0.003)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
18,000	B.C.	Que.	Man.	Sask.	Alta.	Ont.	N.L.	N.S.	N.B.	P.E.I.
	0.041	0.033	0.032	0.029	0.029	0.026	0.024	0.024	0.021	0.020
	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
20,000	B.C.	Que.	Man.	Sask.	Alta.	N.L.	Ont.	N.S.	N.B.	P.E.I.
	0.049	0.041	0.039	0.035	0.035	0.031	0.031	0.030	0.026	0.025
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)	(0.003)

Notes: B.C. = British Columbia; Man. = Manitoba; Sask. = Saskatchewan; Alta. = Alberta; Ont. = Ontario; P.E.I. = Prince Edward Island; Que. = Quebec; N.B. = New Brunswick; N.S. = Nova Scotia; N.L. = Newfoundland and Labrador.
Equivalent income is needs-adjusted using low-income cutoff equivalence scale, and spatial prices-adjusted using low-income cutoff-based deflator. Asymptotic standard errors are in parentheses.
Source: Statistics Canada, Survey of Labour and Income Dynamics, 2000.

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